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# International Federation of Automatic Control

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# Newsletter

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## BUDAPEST CALLING

The Hungarian capital is looking forward to meeting its guests at the IFAC '84 World Congress.

Winter is still going strong but the preparations for the 9th World Congress of IFAC have already reached the boiling point.

The eleven volumes of the IFAC '84 Congress Preprints are in preparation. Most of our authors have submitted their final papers on time.

The computerized database for the congress is growing every day. This system is a great help not only for the organizers but it also makes it possible for us to give prompt information to our participants.

At the Congress sites, in the Academy building, and in the two riverside hotels (the Duna Intercontinental and the Forum) 11 session rooms, and dozens of meeting rooms are waiting for their guests. 30 slide projectors, 30 overhead projectors, and acoustic equipment will facilitate the presentation of the papers.

Six technical visits will be organized to universities, research institutes, industrial and agricultural plants. Eight sight-seeing tours and excursions will provide an opportunity to get to know some of the famous sights of Hungary. These visits can serve to bring to light the historical and religious traditions as well as the culture and hospitality of the Hungarian people.

Considering the slogan of our Congress: "A bridge between control science and technology", the construction of the Budapest bridge is in full swing.

Meet two of the bridge-builders, your hosts in Budapest:



Éva Sós  
Secretary-General



Gusztáv Hencsey  
Vice-chairman of the National  
Organizing Committee

### IFAC Technical Committees Establish New Working Groups

With reference to the list of Working Groups and their Chairmen published in Newsletter No. 1, January 1984, please add the following

- TC-Systems Engineering
- Transportation Systems      R. E. Fenton (USA)

We regret to have omitted this Working Group.



# Manless Factory: The Wrong Alternative

IFAC Workshop on Design of Work in Automated Manufacturing Systems — with special reference to small and medium size firms (November 7—9, 1983, Karlsruhe, Germany).

In recent years many endeavours have been made in various countries to develop manufacturing techniques better adapted than before to man's needs. To exchange experiences and ideas about the design of such systems IFAC's Technical Committees on Social Effects of Automation and on Manufacturing Technologies gathered 92 representatives from 17 countries. Emphasis was placed on new design concepts and practical implementations, most of them presented as case studies, rather than on social analyses and theoretical work.

30 papers and extensive discussions tried to shed light upon seven main topic areas. Deliberations could be summarized as follows:

- **Computer numerical control (CNC) and work design**

With CNC there is no need any more to separate work preparation and programming functions away from shop floor activities, moving them into specialized departments.

Especially for small batch production, the increased variability of products can be handled only by sufficiently high skill and autonomy on the operator's side. Automated systems for small batch metal cutting should be designed, therefore, around the workers' 'tacit knowledge' (notion of Computer-Aided Craftsman).

Comparisons between countries show however that this new latitude in work design has almost not been utilized yet.

- **General work design principles**

To be able to evaluate work processes, both subjective judgement by the working person involved (participation) and assessment of the objective work situation are needed. A large deficit still exists in the area of objective work situation evaluation. A strategy offering economic benefits as well as meeting quality of work criteria seems to be group technology, meaning not only grouping of parts according to manufacturing requirements, but grouping of machinery, personnel and organization as well.

- **Alternative work organizations**

Experiences in three different areas were reported: integrated CAD/CAM systems, production planning and control systems, and flexible manufacturing systems. It was agreed that work structures allowing for demanding job content and sufficient margin of disposition based on high skill have proved superior, especially in machine manufacturing. The key seems to be to complement flexible automation with flexible organization.

- **Experience with an 'autonomous production cell'**

One example of this alternative concept as implemented in a German pump factory was introduced and discussed at length. 'Autonomy' in this concept was explained to mean delegation of essential parts of the responsibility for production planning and control to

the workers on the shop floor. The success sounded convincing: considerable economic advantage combined with job enrichment, were the results.

- **Participation in work design**

Several experiences with workers' participation were reported. The background for all these cases is that considerable degrees of freedom in design do in fact exist. If workers are given the chance to utilize this freedom they prove to be endowed with innovatory qualifications not only improving their own work situation but very often developing far better solutions for the system as a whole. Engineers and all designers of manufacturing systems should realize that in the work design process they might find common interests with the workers.

- **Robots and work design**

Again the examples presented showed the great need for a systems approach in designing robot-based automated systems. To give sufficient autonomy to the manufacturing team enriching the 'residual operations' with additional qualified functions, might considerably improve the availability of the plant and the efficiency of the system.

- **Trends and effects of flexible automation**

Flexible automation is the big chance to introduce high technology adequately into small batch production. Trying to achieve an optimal solution, flexible automation is to be designed carefully by evaluating alternative work process schemes against a comprehensive set of goals (functional, economic and social). Whereas for some large companies the reduction of workers still seems to be a

purpose in itself, smaller firms are more inclined to realize that they should make best use of the existing workforce and its abilities.

A cross-road in industrial production work is emerging at this time. The one approach consists in eliminating production work by technical investment and organizational measures. The other alternative suggests a new combination of advanced technology and skilled production work. A series of industrial examples and plausible considerations indicate clearly that this second approach is not only socially preferable, but gives better results in terms of costs, flexibility and reliability of these manufacturing systems.

For the design of better automated manufacturing systems there exists a technological choice. To be able to utilize this choice for our society as a whole, the false concept called 'manless factory' must be abandoned. Instead, the advantages of technology based on skill can be convincingly shown. If we can agree on this, industrial work will become attractive again also for the young, and our industry's future will not resemble a dead end road.

It is hoped that the results of this Workshop will be beneficial to all dealing with the design of manufacturing systems and that it will help solving problems of firms — especially of small and medium size enterprises — in our industrial branches. Learning about experiments already performed will hopefully encourage them to try out something by themselves.

Pergamon Press has scheduled publishing the Workshop Proceedings in Spring 1984.

Tom Martin  
Chairman IPC



Laxenburg — The road in front of the IFAC Secretariat crowded with IFAC Officers taking a break between two meetings last November.



# Automatic Control Education

P. Martin Larsen, Chairman EDCOM

The Education Committee (EDCOM) of IFAC was established in 1958 with A. Marina (Italy) as chairman. For more than 25 years it has been concerned with the study and dissemination of information about the planning and practice of automatic control education. Three reports of major importance have been published within the field of Automatic Control Education (see list of EDCOM Publications [1, 2, 3]).

In addition a series of case reports describing experiences in group and project oriented teaching in Automatic Control has been published primarily for distribution among members of EDCOM and its Working Groups.

Apart from sponsoring and co-sponsoring symposia and workshops EDCOM has organized technical sessions and round table discussions on specific topics related to education at most IFAC World Congresses.

A main concern of EDCOM in recent years has been the problems related to Automatic Control Education in Developing Countries, and therefore EDCOM has organized round table discussions on this topic at a number of conferences sponsored by the Developing Countries Committee (DECOM).

Throughout the years EDCOM has appointed ad hoc working groups for special tasks. In 1961, for example, a group of professors, heads of Automatic Control Laboratories in Northwestern Europe on initiative of C. Verhagen agreed to a scheme for exchange of information within Automatic Control Education [6]. This group, which met for the first time in Basel during the 2nd IFAC World Congress, was later transformed into a "Subcommittee on Cooperation between Northwestern European Universities". Attempts have been made later to establish subcommittees in other regions, e.g. in the Americas, but without any result until now.

The Subcommittee has organized annual meetings since 1966, and the personal contacts have been of great importance as support for the activities of EDCOM during these last years.

In 1983 it was decided to establish two more permanent working groups on the following topics:

- WG 7.1: Continuing Education (P. Martin Larsen)
- WG 7.2: Educational Programs on Robotics (P. P. Groumos).

## AUTOMATIC CONTROL EDUCATION ON UNIVERSITY LEVEL

### Curricula

In 1964—65 a survey on Automatic Control Education on University Level was prepared by the EDCOM chairman W. Findeisen, comparing reports from 17 countries.

The data presented show, as could be expected, that the theory-versus-technology proportion may vary considerably at university level engineering education in different

countries, e.g. Canada, Japan and USA at that time were going deeply into the "sophisticated concepts of non-linear dynamics, optimization, sensitivity analysis, and adaptive systems, while at the same time little attention was paid to more technical problems of control systems applications and to the hardware". [7].

Updated material on University Level Education in 27 countries is presented as flow diagrams in the more recent reports on Continuing Education. [3].

A similar task is being undertaken by the newly formed Working Group on "Educational Programs on Robotics". Under the Chairmanship of P. P. Groumos (USA) this group is preparing a survey report on Educational Programs on Robotics on University Level, i.e. registration of courses (interconnected and/or interdisciplinary), which enables students to specialize in design and application of modern robotics.

### Control Laboratories

The main purpose of automatic control education is to teach the students how to design automatic control systems.

Inasmuch as a student only learns by what he is doing himself, the laboratory courses play a very important role in the teaching process.

In 1973 the EDCOM Subcommittee decided to prepare a "Catalogue on Laboratory Control Equipment". The aim of the catalogue was to present a number of laboratory models for experiments and demonstrations within the field of Automatic Control. The descriptions were limited to a few pages sufficient for the reader to judge if the equipment was suitable for duplication in his own laboratory. A total of 130 descriptions have been compiled. Based on this catalogue a survey report by P. Martin Larsen on "Control Laboratory Education in Western Europe" was presented at the 6th IFAC World Congress in Boston, 1975. [9].

### Computer Aided Instruction and Design

At the IFAC Symposium in Barcelona, 1977, a survey report on "Interactive Computer Programs for Education and Research" was presented by W. J. M. Lemmens and A. J. W. van den Boom [10].

The pedagogical and psychological aspects of computer aided instruction were one of the main topics at the IFAC/IFIP Conference "Training for Tomorrow" in Holland, 1983 (cosponsored by EDCOM). The following subjects are important:

1. What functions do computers perform.
2. How to select and use data in a given problem situation.
3. What are the social effects of the information technology.

Systems theory in its present form provides a good framework for training analysis and design. [11].

### Exchange of Computer Programs

A Program Information Center (PIC) was established by the EDCOM Subcommittee in 1973, and a program-list containing short information on all announced programs are periodically sent to each interested laboratory. PIC is not involved in questions concerning the author's rights but agreements should be arranged directly between the interested parties. Further information is available from M. Mansour, ETH, Zurich.

### CONTINUING EDUCATION

During the Fifth IFAC Congress in Paris 1972 EDCOM decided on initiative from P. Eykhoff to start an IFAC project directed towards "The Continuing Education in Control Engineering".

The report was compiled by H. Feikema, The Foundation for Post-degree Education in Control Engineering in Holland, and published in 1975, with a second edition in 1980 [3]. A proposal for further actions to be taken [13] was presented to the EDCOM subcommittee in 1982 and to the IFAC Technical Board in November 1983.

It was approved that H. Feikema should be encouraged to put the proposal into operation. At the same time it was approved that EDCOM should establish a working group on "Continuing Education for Control Engineers" to support further details and future activities within this field.

### AUTOMATIC CONTROL EDUCATION IN DEVELOPING COUNTRIES

The co-operation between EDCOM and DECOM has been very fruitful throughout the last ten years and EDCOM has co-sponsored several IFAC Conferences and Workshops in Developing Countries. During these events and also during the IFAC Congresses in 1978, 81, 84 Round Tables and Panel Discussions on Educational Aspects have been organized by the EDCOM chairman [14, 15, 16, 17, 18].

In 1982 a proposal for a new IFAC project was formulated by M. Cuenod and W. Schaufelberger in relation to "Technology Transfer in Automatic Control and Systems Engineering". The proposal defines some practical ways sponsored by EDCOM and SECOM to contribute to the exchange of scientists, information and knowledge between teaching and research institutions in industrialized and developing countries.

The project does not suggest to create an IFAC clearing office of scientists, equipment or publications, but to act as a catalyst promoting a direct contact between providers and receivers [19].

### FUTURE ACTIVITIES

In the future EDCOM will primarily try to continue its present activities and to meet the

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## EDCOM (ctd.)

following objectives either directly or through its subcommittees and working groups:

1. Information about continuing education courses in periodicals.
2. Initiation of new continuing education courses where necessary.
3. Publication of EDCOM case reports on group and project oriented teaching experiences in Automatic Control.
4. Interchange of computer programs related to automatic control through the Program Information Center in Zurich.
5. Promotion of the IFAC project on "Technology Transfer".
6. Publication of Survey Reports on special educational programs, e.g. in Robotics.
7. Eventually publication of a new and revised catalogue on Laboratory Control Equipment.

The activities of EDCOM depend exclusively on voluntary contributions from dedicated

colleagues within the automatic control and systems engineering field. Hopefully in the future chairmen and officers of EDCOM will succeed in their work as we did in the past.

## LIST OF EDCOM-PUBLICATIONS:

- [ 1 ] W. Findeisen: Education in Automatic Control on the University Level, IFAC 1965.
- [ 2 ] W. Oppelt: Education of the Engineer of Medium Level in Automatic Control, IFAC 1969.
- [ 3 ] P. Eykhoff, H. Feikema: Continuing Education in Automatic Control. Survey Report. IFAC: 1st ed. 1975, 2nd ed. 1980.
- [ 4 ] S. Kahne: Report from Dresden. Automatica, Vol. 8, pp. 513—515, 1972.
- [ 5 ] P. Martin Larsen: Trends in Automatic Control Education. Automatica, Vol. 15, pp. 101—104, 1979.
- [ 6 ] C. J. D. M. Verhagen: Short History of the "IFAC Education Subcommittee on Co-operation between Western European Universities", Delft, NL, 1983.
- [ 7 ] W. Findeisen: Notes on the results of the Informal Colloquium on Education, III IFAC World Congress, London, 1966.
- [ 8 ] R. Isermann: Evaluation of a Questionary on Text Books used for Courses in Automatic Control and Measurement Techniques, 1974.
- [ 9 ] P. Martin Larsen: Control Laboratory Education in Western Europe. 6th IFAC World Congress, Boston, 1975.
- [ 10 ] W. J. M. Lemmens, A. J. W. van den Boom: "Interactive Computer Programs for Education and Research: A Survey", Automatica, Vol. 15, No. 1, pp. 113—121, 1979.
- [ 11 ] J. E. Rijnsoorp et al.: Conclusions and Recommendations from the IFAC/IFIP Conference "Training for Tomorrow", Leiden, NL, 1983. To appear in the Proceedings.
- [ 12 ] R. Gi Boiten: The relevance of an industry-university dialogue on control engineering education: Summary and conclusions from a Round Table, 7th IFAC World Congress, 1978.
- [ 13 ] H. Feikema: Continuing Education of Control Engineers in Europe. EDCOM Subcommittee meeting 1982 in Ghent, B.
- [ 14 ] P. Martin Larsen: How Can Industrialized Nations Support Control Education in Developing Countries? 7th IFAC World Congress, Helsinki, SF, 1978.
- [ 15 ] P. Martin Larsen: Automatic Control Education in Developing Countries. Report from 3rd IFAC/IFIP/IFORS Conference on "Systems Approach for Development", Rabat, Morocco, 1980. IFAC Newsletter, No. 4, 1981.
- [ 16 ] P. Martin Larsen: Human Engineering Aspects and Education of DCCS Operators. 3rd IFAC Workshop on Distributed Computer Control Systems. Beijing, China, 1981.
- [ 17 ] P. Martin Larsen: Automatic Control Education in Developing Countries. Report from RT 8, 8th IFAC World Congress, Kyoto, Japan, 1981.
- [ 18 ] P. Martin Larsen: Education of Design Engineers and Operators for Development Projects. Report from Round Table at the IFAC workshop on "Computer Aided Design of Projects and Development Policies", Ankara, Turkey, 1982.
- [ 19 ] M. Cuenod: Contribution of IFAC to the Transfer of Automatic Control and Systems Engineering Technology, IFAC Newsletter, No. 4, 1982.
- [ 20 ] O. I. Franksen: On the Future in Automatic Control Education. Automatica, Vol. 8, pp. 517—524, 1972.
- [ 21 ] O. Rademaker: A Systems Approach to the Formulation of Objectives of a University Control-Engineering Group. IFAC Symposium on "Trends in Automatic Control Education", Barcelona, Spain, 1977.
- [ 22 ] S. Kahne: Introducing Systems Concepts to all University Students. IFAC Symposium on "Trends in Automatic Control Education", Barcelona, Spain, 1977.

Most publications are available from the EDCOM chairman P. Martin Larsen, Electric Power Engineering Department, \*build. 325, Technical University, DK-2800 Lyngby, Denmark.

## WHO IS WHO IN IFAC



Prof. Guido Guardabassi  
Chairman of the  
Systems Engineering Committee

Guido Guardabassi was born on February 12, 1940 in Piacenza, Italy. He took his Dr. Ing. Degree in Electronic Engineering from the Politecnico di Milano in 1964 and the Libera Docenza in Automatic Control in 1971. Since 1975 he is full professor of Automatic Control at the Politecnico di Milano, where he served as Chairman of the Electronic Engineering Faculty Council in 1976 and 1977. He is married and has two boys.

Dr. Guardabassi, former President of GRIS (the Italian National Association of Researchers in System and Computer Science), is Vice-President of ANIPLA (the Italian National Association for Automation).

Within IFAC, he has been one of the organizers, in 1973, of the Ischia Symposium on Sensitivity, Adaptivity and Optimality. In cooperation with Giorgio Quazza and Arturo Locatelli he proposed and organized the first IFAC Symposium on Large-Scale Systems: Theory and Applications (Udine, 1976). He participated in the activity of SECOM as member (since 1976), Vice-Chairman (1978—1981) and Chairman (since 1981). Under the stimulus of Michel Cuenod, in 1979 he has been one of the founders and the first Chairman of the SECOM W.G. on Computer Aided System Analysis and Design. He served as member of the IPC in numerous IFAC events (Symposia and Workshops), including two Congresses. In 1979, he chaired the IPC of the second IFAC Symposium on Large-Scale Systems: Theory and Applications (Toulouse, France).

He worked and lectured in several foreign Universities or Research Institutions: Stanford (1969), Belgrade, Center for Advanced Studies (1970), Ghent (1974), Harvard (1978), Berkeley (1978, 1981).

His research interests are documented by more than 90 papers covering various aspects of the theory of Automatic Control and its applications to industrial processes.

Dr. Guardabassi is also the author or the editor of a number of text and research books and associate editor of one national (Ricerche di Automatica) and three international journals (Automatica, Large-Scale Systems, Optimal Control: Applications and Methods).

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An updated list of IFAC Publications published by Pergamon Press is now available. Please refer to

Pergamon Press  
Headington Hill Hall  
Oxford OX 3 0BW, England  
or to the IFAC Secretariat



# FORTHCOMING EVENTS

Title	1984	Place	Deadlines	Further Information
IMACS/IFAC Int'l Symposium Modelling and Simulation of Electrical Machines and Converters	May 17 — 18	Liège, B	—	Prof. H. Buysse Unité Courant Fort et Electrotechnique Université Catholique de Louvain Bâtiment Maxwell Place du Levant 3 B-1348 Louvain-la-Neuve, Belgium
6th INRIA/IFAC Int'l. Conference Analysis and Optimization of Systems	June 19 — 22	Nice, F	—	Prof. A. Bensoussan INRIA Domaine de Voluceau B.P. 105 F-78153 Le Chesnay, France
<b>9th WORLD CONGRESS IFAC</b>	<b>JULY 2 — 6</b>	<b>BUDAPEST, H</b>	—	Computer and Automation Institute Hungarian Academy of Sciences P. O. Box 63 H-1502 Budapest, Hungary
				
IFIP/IFAC Conference Human Factors in Computer Systems Human-Computer Interaction INTERACT '84	Sept. 3 — 7	London, UK	—	Prof. B. Shackel Dept. of Human Sciences University of Technology Loughborough Leicestershire, UK
IFAC Workshop Reconfigurable Spacecraft Systems Autonomous and Non-Autonomous	Sept. 11 — 13	Cambridge MA, USA	—	John W. Hursh Aircraft and Spacecraft Division The Charles Stark Draper Lab., Inc. 555 Technology Square Cambridge, MA 021389, USA
Title	1985	Place	Deadlines	Further Information
IFAC/IFORS/IFIP Workshop Artificial Intelligence Pattern Recognition in Economics and Management	March 12 — 14	Zurich, CH	not yet known	Prof. L. F. Pau Battelle Institute 7, Route de Drize CH-1227 Carouge Switzerland
6th IFAC Workshop Distributed Computer Control Systems	May 19 — 24	San Francisco, CA, USA	not yet known	Dr. R. W. Gellie CSIRO P.O. Box 71 Fitzroy, 3065 Australia
IFIP/IFAC Conference Programming Languages for Machine Tools (PROLAMAT)	June 11 — 13	Paris, F	May 1, 1984	AF CET 156, Bd. Pereire F-75017 Paris, France
IFAC Workshop Control Application of Nonlinear Programming and Optimization	June 11 — 14	Capri, I	not yet known	Prof. G. Di Pillo Dipartimento di Informatica e Sistemistica Universita di Roma „La Sapienza“ Via Eudossiana 18 I-00184 Rome, Italy
IFAC Workshop Model Error Concepts and Compensation	June 17 — 18	Boston, MA, USA	not yet known	Prof. R. E. Skelton Purdue University Aeronautics & Astronautics 331 Grissom Hall West Lafayette, IN 47907, USA



# FORTHCOMING EVENTS (ctd.)

Title	1985	Place	Deadlines	Further Information
IFAC/ISAGA Workshop Simulation and Games	June	Alma-Ata, SU	not yet known	Acad. V. A. Trapeznikov Institute of Control Sciences Profsojuznaja 65 Moscow 117342, USSR
IFAC Symposium Automatic Control in Space	June 24—28	Toulouse, F	June 30, 1984	Prof. M. Pelegrin CERT Complexe Aérospatial de Lespinet 2, Avenue Édouard Belin BP 4025 F-31055 Toulouse Cedex France
IFIP/IFAC Symposium Automation for Safety in Shipping and Offshore Petroleum Operations — ASSOPO '85	June 25—27	Trondheim, N	not yet known	The Norwegian Society of Automatic Control Kronprinsens gt. 17 Oslo 2, Norway
7th IFAC/IFORS Symposium Identification and System Parameter Estimation	July 3—7	York, UK	April 1, 1984	Prof. H. A. Barker University College of Swansea Dept. of Electrical and Electronic Engineering Singleton Park Swansea SA2 8PP, UK
1st IFAC Symposium Automation for Mineral Resource Development	July 9—11	Brisbane, AUS	April 1, 1984	Prof. Alban J. Lynch Julius Kruttschnitt Mineral Research Centre University of Queensland Isles Road, Indooroopilly, QLD 4068 Australia
IFAC Symposium Planning and Operation of Electric Energy Systems	July 22—25	Rio de Janeiro, BR	June 1, 1984	T. E. DyLiacco Consultant 651 Radford Drive Cleveland, OH 44143 USA
3rd IFAC/IFIP Symposium Computer Aided Design in Control and Engineering Systems	July 31— Aug. 2	Copenhagen, DK	Sept. 1, 1984	Prof. P. M. Larsen Electric Power Engineering Building 325 DK 2800 Lyngby, Denmark
Regional Conference Control Science and Technology for Development	August 20—22	Beijing, PRC	not yet known	Prof. YANG Jiachi Beijing Institute of Control Engineering P.O. Box 2417 China
2nd IFAC/IFIP/IFORS/IEA Conference Analysis, Design and Evaluation of Man-Machine Systems	Sept. 10—12	Varese, I	Sept. 15, 1984	Prof. Dr. Ing. Gunnar Johannsen Laboratory for Man-Machine Systems (FB 15) University of Kassel (GhK) P.O. Box 10 13 80, D-3500 Kassel, FRG
7th IFAC/IFIP/IMACS Symposium Digital Computer Application to Process Control	Sept. 17—20	Vienna, A	not yet known	Dr. P. Kopacek Ö P W Z Postfach 131 1014 Vienna, Austria
IFAC/IFORS Symposium Systems Analysis Applied Water and Related Land Resources	Oct. 2—4	Lisbon, Portugal	not yet known	Prof. Luis Valadares Tavares APDIO Av. Rovisco Pais 1000 Lisbon, Portugal
1st IFAC Symposium Robot Control	Nov.	Barcelona, E	—	Prof. G. Ferrate Polytechnic University of Barcelona Via Augusta 242 Barcelona, Spain
1st IFAC Symposium Modelling and Control of Biotechnological Processes	Dec. 11—13	Noordwijker- hout, NL	Oct. 1, 1984	Prof. Dr. A. Johnson Lab. voor Fysische Technologie Prins Bernhardlaan G 2628 BW Delft The Netherlands